

Temporomandibular disorder (TMD): Incorrect posture a reason?

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ABSTRACT

Objective: Various etiologic factors are linked to temporomandibular disorder but no specific study has been done to investigate the influence of various sitting and sleeping positions which could have a major influence. The present questionnaire survey was conducted to analyze whether these positions actually cause temporomandibular disorder or is it just an enhancing factor for temporomandibular disorder symptoms.

Materials and methods: This cross-sectional Questionnaire study was carried out among total 399 dental students of Yene-poya University in India.

Result: All four positions do not significantly contribute in clicking Temporomandibular joint, pain in cheek and jaw region, deviation of mandible, severe headache, migraine, dizziness, tinnitus, neck and shoulder pain. As for the time factor, there were significant higher odds of having pain in cheek region and jaw, deviation of mandible and tinnitus among respondents who positioned themselves at mentioned position for less than 20 minutes

Conclusion: Although none of the mentioned position in our study directly contributed to these symptoms, improper positioning being their risk factor remains since types of position in the questionnaires were limited.

Clinical Significance: Maintaining positions for less than 20 minutes each day may intensify the likelihood of temporomandibular joint abnormalities, and the odds could be accentuated with longer time span. There is good scope for further studies on various other positions. Establishing a solid relation between these positions and the accentuation of symptoms would be of prime importance in advising patients with temporomandibular disorders and related problems to avoid these positioning through proper counselling.

Keywords: Positions, Pain, Temporomandibular joint (TMJ), Temporomandibular disorder (TMD), Oral and Maxillofacial Pathology Journal (2021): <http://www.ompj.org/archives>.

INTRODUCTION

In general dental practice it has become very common to encounter a painful condition involving the Temporomandibular joint and muscles involved in mastication, the condition is named as Temporomandibular disorders (TMDs)¹. Approximately 10% of the general population has experience of TMDs².

The symptoms of TMD are many and varied. The part of body like face, preauricular areas and temples are common complaint sites apart from pain during chewing and mouth opening with sounds like popping, crepitus, grating and clicking being heard or felt. Other symptoms of TMD are severe headache, migraine, dizziness, tinnitus (ringing of ears), neck or shoulder pain³.

The Temporomandibular disorder (TMD) could be result of many factors including hormonal influences, muscle hyperfunction, trauma muscle parafunction, rheumatoid arthritis (RA) and articular changes⁴. Clenching teeth, bruxism, Chewing of gums, lip biting, fingernail biting, chewing on pencil are considered parafunctional activities and such activities are more likely to compromise the masticatory muscle tissues and create pain³. Clicking sound of TMJ is often associated with mechanical interferences with the joint and consequences of parafunctional activities⁵.

Anatomically TMJ is one of the components of stomato-

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gnathic system interconnected and interrelated between base of the skull and mandible and connected to neck via ligaments and muscles, this complex interaction between head and neck region and stomatognathic system provides relationship between postures and TMD⁶. The imbalance produced especially postural in relation to skeletal system and mandible is most of time associated factor for upper quarter muscular problems of the body.⁷

Evic and Aksoy study reemphasizes on the hypothesis that TMDs are related to muscle imbalance and poor postures⁸. How-

ever, the systematic review studies found the relation between muscular TMD, intrarticular TMD and cervical and head postures is still not clear^{9,10}.

There are some improper positioning of the heads (Fig 1, 2, 3, 4) used by most of the people in their daily life in work place or other places which can lead to muscle fatigue and direct pressure on the TMJ and associated structures. To date there is no published information on the relationship between improper head positions and TMD. The aim of the present study is to identify whether these positions are associated with TMD among students from Yenepoya Dental College, Karnataka, India.

Approval for the study was obtained from the Research Ethics Committee of the Yenepoya Dental College, Karnataka, India.

METHODOLOGY

This cross-sectional study was carried out in Yenepoya Dental College, Karnataka, India after taking ethical approval from the department of oral pathology, Yenepoya Dental college ethical committee from January to March 2012. A total 399 dental students from first year to final year consented and participated in the study. The dental students were selected because it was easier for them to understand the meanings and the importance of the questionnaire and they would answer it with full awareness.

First part of questionnaire was asking about demographic information and five items regarding improper head position and TMD were asked in the second part. Digitally drawn images were used to describe various position in this study.

The first item was asking the position that subject position him or herself quite often while lying down or sitting at the table. Four types of positions were shown in the questionnaire from which the subject shall choose the position that he or she positions the most. Position A is bringing both arms together and placing chin on the arms (Fig 1). Position B is placing head on one arm while lying or sitting (Fig 2). Position C is a head tilted 45° to left or right side, re-

spective palm supported the cheek and jaw while elbow resting on any surface (Fig 3). In position D chin rest on both hands, while both elbows rest on any surface (Fig 4).

The second item was asking when the subject does position him or herself in the above mentioned positions. The choice can be made among a) while reading papers/ books, b) while using computer or laptop, c) while sleeping, and d) while playing games or casual talk.

Approximate time of spending each day in any of the previously mentioned positions was asked in third item. Amount of time to choose were; a) Less than 20 minutes, b) 20 to 30 minutes, c) 40 to 50 minute, and d) more than 1 hour. The fourth item was asking if the subject has any abnormalities related to TMJ namely, a) clicking, b) deviation of mandible while opening the mouth, c) inability to open the mouth widely, and d) pain in the cheek region or jaw. Lastly, if the subject has suffered any symptoms (severe headache / migraine /dizziness, tinnitus (ringing of ears), neck or shoulder pain, pain in or under ears, or none) related to TMJ disorders was asked. All the variables were score 0 for No and 1 for Yes response.

STATISTICAL ANALYSIS

The data were analyzed using IBM SPSS statistic version 20.0. Frequency percentage was calculated for all categorical variables. Chi square test was used to determine the association between positions and TMJ abnormalities. Binary logistic regression test was used to identify the influencing factor of TMJ abnormalities. The level of significance was set at 0.05.

RESULTS

Of total 399 subjects, 185 (44.2%) were male and 214 (52.3%) were female. Their age range from 18 to 25 year with mean (SD) age 23 (5.6).

Respondents often position themselves while sitting or lying



Figure 1. Position A. In this position both arms are brought together and placing chin on the arms.



Figure 2. Position B. In this position, the head is placing on one arm while lying or sitting.



Figure 3. Position C. In this position, a head is tilted 45° to left or right side, respective palm supported the cheek and jaw while elbow resting on any surface.



Figure 4. Position D. In this position, the chin rest on both hands, while both elbows rest on any surface.

Variables	Frequency (%)			
	Position A	Position B	Position C	Position D
	51(12.8)	208 (52.1)	71 (17.8)	69 (17.3)
Position oneself in the mentioned position				
While reading papers, books	7 (1.7)	1 (0.3)	13 (3.3)	11 (2.8)
While using computer or laptop	29 (7.2)	3 (0.8)	52 (13.0)	56 (14.0)
While sleeping	6 (1.5)	173 (43.4)	4 (1.0)	0 (0.0)
While playing games or casual talk	9 (2.3)	30 (7.5)	2 (0.5)	2 (0.5)
Time spend each day in the mentioned position				
Less than 20 minutes	8 (2.0)	40 (10.0)	17 (4.3)	7 (1.7)
20 to 30 minutes	14 (3.5)	63 (15.8)	17 (4.3)	25 (6.3)
40 to 50 minutes	27 (3.8)	75 (18.8)	30 (7.5)	30 (7.5)
More than one hour	3 (0.8)	28 (7.0)	7 (1.7)	7 (1.7)

Table 1: Sitting or lying position by when and spending time of the mentioned position (N=399)

Variable	Frequency	(%)
Abnormalities	78	(19.5)
Clicking		
Deviation of mandible while opening the mouth	21	(5.3)
Inability to open the mouth widely	5	(1.3)
Pain in the cheek region or jaw	188	(47.1)
Symptoms		
Severe headache, migraine, dizziness	170	(42.6)
Tinnitus (ringing ears)	47	(11.8)
Neck or shoulder pain	125	(31.3)
Pain in or under ears	6	(1.5)

Table 2: Distribution of abnormalities and symptoms related to TMJ (N=399)

down and when they do position themselves in mentioned position (while reading, using computers, playing games or casual talks) and time they spend of the mentioned position. As shown in Table 1

The most common habit of respondents positioning themselves was position B that is mainly during sleeping followed by position C and D. Position D and position C are the most common positions placing themselves by respondents while using computer or laptop. Subjects spend maximum 40 to 50 minutes each day in the mentioned position. Position B is the most common position that subjects place themselves more time.

The most common abnormality related to TMJ was pain in the cheek region or jaw (47.1%) followed by clicking (19.5%). Severe headache, migraine, dizziness, was the most common symptoms (42.6%) that related to TMJ disorders followed by neck or shoulder pain (31.3%) as shown in Table 2

Variable	Crude OR	(95% CI OR)	X ² statistic (df) ^a	P- value
Position A				
Yes	1.31	(0.653; 2.64)	0.566 (1)	0.443
No	1			
Position B				
Yes	0.61	(0.37; 1.00)	3.712 (1)	0.054
No	1			
Position C				
Yes	1.67	(0.92; 3.02)	2.684 (1)	0.093
No	1			
Position D				
Yes	1.05	(0.55; 2.02)	0.029 (1)	0.856
No	1			
Less than 20 minutes				
Yes	2.13	(1.19; 3.80)	6.202 (1)	0.010
No	1			
20 to 30 minutes				
Yes	1.23	(0.72; 2.08)	0.561 (1)	0.451
No	1			
40 to 50 minutes				
Yes	0.781	(0.47; 1.03)	0.899 (1)	0.346
No	1			
More than 1 hour				
Yes	0.369	(0.13;1.06)	4.305 (1)	0.065
No	1			

^aLikelihood ratio (LR) test

Table 3: The association between clicking TMJ and positions and time spending in mentioned position.

Since minority of respondents reported the abnormalities particularly, deviation of mandible and inability to open the mouth widely, we analyzed the relationship between positions and clicking and pain in cheek region or jaw. Less than 10% of subjects reported to have deviation of mandible while opening the mouth, inability to open the mouth widely, and pain in or under ears. Further, to identify whether abnormalities and symptoms related to TMJ were influenced by four positions and time spending each day, simple logistic regression test was used to analyze. Factors associated with clicking TMJ was demonstrated in table 3.

Likelihood test shows all four positions do not significantly contribute in clicking TMJ. The odds ratios each positions were not significantly different (P>0.05). As for the time factor, there were sig-

Variable	Crude OR	(95% CI OR)	X ² statistic (df) ^a	P- value
Position A				
Yes	0.57	(0.31; 1.05)	3.335 (1)	0.073
No	1			
Position B				
Yes	1.25	(0.859;1.89)	1.450 (1)	0.229
No	1			
Position C				
Yes	0.96	(0.58; 1.62)	0.014 (1)	0.905
No	1			
Position D				
Yes	1.04	(0.62; 1.74)	0.017 (1)	0.897
No	1			
Less than 20 minutes				
Yes	1.74	(1.04; 2.91)	4.436(1)	0.037
No	1			
20 to 30 minutes				
Yes	2.28	(1.47; 3.53)	13.830 (1)	<0.001
No	1			
40 to 50 minutes				
Yes	0.52	(0.35; 0.79)	9.873 (1)	0.002
No	1			
More than 1 hour				
Yes	0.32	(0.16;0.66)	11.003 (1)	0.002
No	1			

^aLikelihood ratio (LR) test

Table 4. The association between pain in cheek and jaw region and positions and time spending in mentioned position.

nificant higher odds of having clicking TMJ in subjects who placed themselves at mentioned position for less than 20 minutes.

Likelihood test shows all four positions do not significantly contribute the pain in cheek and jaw region. The odds ratios each positions were not significantly different (P>0.05). As for the time factor, there were significant higher odds of having pain in cheek region and jaw among respondents who positioned place themselves for less than 20 minutes and 20 to 30 minutes (Table 4).

Likelihood test shows all four positions do not significantly contribute deviation of mandible. The odds ratios each positions were not significantly different (P>0.05). As for the time factor, there were significant higher odds of having deviation of mandible among respondents who positioned place themselves for less than 20 minutes (Table 4).

Variable	Crude OR	(95% CI OR)	X ² statistic (df) ^a	P- value
Position A				
Yes	2.26	(0.79; 6.45)	2.024(1)	0.129
No	1			
Position B				
Yes	1.01	(0.42;2.44)	0.001 (1)	0.981
No	1			
Position C				
Yes	1.09	(0.36; 3.35)	0.023 (1)	0.877
No	1			
Position D				
Yes	0.23	(0.03; 1.73)	3.391 (1)	0.152
No	1			
Less than 20 minutes				
Yes	3.12	(1.20; 7.58)	4.983(1)	0.019
No	1			
20 to 30 minutes				
Yes	0.94	(0.36; 2.48)	0.017 (1)	0.897
No	1			
40 to 50 minutes				
Yes	0.57	(0.22; 1.50)	1.386 (1)	0.254
No	1			
More than 1 hour				
Yes	0.38	(0.50;1.90)	1.160 (1)	0.350
No	1			

^aLikelihood ratio (LR) test

Table 5. The association between deviation of mandible and positions and time spending in mentioned position.

Likelihood test shows all four positions do not significantly contribute severe headache, migraine, dizziness. The odds ratios each positions were not significantly different ($P>0.05$). Likewise, spending time on the mentioned position do not associated with severe headache, migraine, dizziness.

Likelihood test shows all four positions do not significantly contribute the tinnitus (ringing ears). The odds ratios each positions were not significantly different ($P>0.05$). However, likelihood test shows there is significant higher odds of having tinnitus among subjects who placed themselves at mentioned position for less than 20 minutes (Table 7).

Table 8 demonstrates neither positions nor spending time on that position do not associated with neck or shoulder pain.

DISCUSSION

The positions that investigated in this study are commonly

Variable	Crude OR	(95% CI OR)	X2 statistic (df)a	P- value
Position A				
Yes	0.94	(0.52; 1.70)	0.049 (1)	0.825
No	1			
Position B				
Yes	0.94	(0.63;1.39)	0.108 (1)	0.742
No	1			
Position C				
Yes	1.13	(0.67; 1.89)	0.214 (1)	0.643
No	1			
Position D				
Yes	1.04	(0.62; 1.76)	0.026 (1)	0.872
No	1			
Less than 20 minutes				
Yes	1.54	(0.92; 2.57)	2.754 (1)	0.097
No	1			
20 to 30 minutes				
Yes	1.29	(0.84; 2.00)	1.369 (1)	0.242
No	1			
40 to 50 minutes				
Yes	0.81	(0.54; 1.21)	1.075 (1)	0.301
No	1			
More than 1hour				
Yes	0.54	(0.23;0.90)	5.521(1)	0.024
No	1			

^aLikelihood ratio (LR) test

Table 6: The association between severe headache, migraine, dizziness and positions and time spending in mentioned positions

practiced by people in their daily life without knowing that these positions maybe unhealthy. To the extent of our knowledge, the present study is the first work to investigate whether there is association between TMD and improper head positions that people habitually place themselves in their daily life in young adult university students in India. Among these four head positions, placing a head on one arm (Position B) is the most common position that more than half of the subjects positioned themselves (52.1%). Position B is the position that subjects spent time the most since it is position of sleeping. Practicing position C and D is common among 17.8% and 17.2% of subjects respectively and about 13% placed themselves at position A. In any of mention position, subjects spend maximum 40 to 50 minutes and not more than one hour except for position B. Position A, C, and D are the positions that people habitually placed themselves while using laptop or computer.

Variable	Crude OR	(95% CI OR)	X2 statistic (df)a	P- value
Position A				
Yes	1.23	(0.52; 2.90)	0.205 (1)	0.645
No	1			
Position B				
Yes	1.16	(0.63;2.13)	0.218 (1)	0.641
No	1			
Position C				
Yes	0.94	(0.42; 2.11)	0.022(1)	0.882
No	1			
Position D				
Yes	0.67	(0.27; 1.65)	0.817 (1)	0.385
No	1			
Less than 20 minutes				
Yes	3.43	(1.78; 6.60)	12.442(1)	<0.001
No	1			
20 to 30 minutes				
Yes	1.39	(0.73; 2.63)	0.993(1)	0.313
No	1			
40 to 50 minutes				
Yes	0.22	(0.10; 0.51)	14.600 (1)	<0.001
No	1			
More than 1hour				
Yes	1.45	(0.61;3.45)	0.648(1)	0.406
No	1			

^aLikelihood ratio (LR) test

Table 7: The association between tinnitus (ringing ears) and positions and time spending in mentioned position.

We investigated if these positions could cause TMJ disorders since the muscles of jaw, head, neck, shoulder and TMJ are involved with these positions. Generally, TMDs are thought to have a 'multifactorial' etiology, probably linked to the muscles associated with the joint, and pathology inside the joint itself. Head posture is largely determined by a balance in muscle tonus of the cervical/spinal musculature and the primary and secondary muscles of mastication.

The movement of mandible is under the control of four muscles of mastication called medial pterygoid, lateral pterygoid, masseter and temporalis. The Masseter is rectangular and thick and controls elevation of mandible giving a powerful closure of the jaw. It also helps in protrusion of mandible by contraction of its superior part, further, most of the tension is stabilized in relation to articular disc of the TMJ¹¹.

Position A and D would not cause any direct effect on the Masseter muscle but may cause secondary effect due to the pressure on

lower anterior and symphysis area of the mandible. Position B and C have more chances of pressure falling on the Masseter muscle.

Position A and D could have some degree of pressure on pterygoid muscles mainly due to the insertion of medial pterygoid muscle to the inner surface of the mandibular angle and the insertion of the lateral pterygoid muscle onto the articular disc of the TMJ whereas position B and C could have direct pressure to a minimum degree on the pterygoid muscles

The Temporalis (Temporal muscle) is situated at the sides of head and is broad, radiating and arising from temporal fossa and deep surfaces of temporal fascia converging deep toward zygomatic arch and is inserted to apex, anterior border and medial surface of coronoid process and also the ramus of the mandible on its anterior border. It raises the mandible against the maxilla with great force¹².

All four positions A, B, C and D, could cause some extent of pressure to the temporalis muscle and the articular disc directly or secondarily. In this study 47% of subjects reported to have pain in the cheek region or jaw who habitually position themselves in one form of position stated.

The study by Yap exhibited facial muscle pain were encountered in 31.4% of the TMDS patients in Asia¹³. Women in their 20s and women approaching menopause are commonly effected by muscle tightness and pain¹⁴. However, these causes are not investigated in the present study.

In this study, the most common abnormality related to TMJ was pain in the cheek region or jaw. Thus it certainly means that improper positioning also has a huge involvement in causing muscle fatigue and even initiating TMJ pain or increasing the already existing pain. We also found there was a higher likelihood of pain in cheek and jaw area among respondents with improper positioning for 20 mins, and the odds interestingly were low for more than 40 mins and above, this was also true for deviation of mandible and clicking sounds in TMJ (Table 3, 4 and 5), this may be explained by the fact that the subject would not continue the same position if he felt pain in the initial 20 mins time.

These figures strongly suggest that improper positioning over a period of time renders Masseter and temporalis muscles under strain; thereby muscle fatigue occurs and causes pain in the cheek region or jaw. Like clenching and grinding, muscle overload could also resulted from long time improper lying or sitting, bringing on symptoms such as muscle pain. Therefore, the pain in the cheek region or jaw reported in our study infers improper lying or sitting contributes to TMDs.

There are multiple abnormalities and symptoms related to TMJ disorders, few important abnormalities are clicking, deviation of mandible while opening the mouth, inability to open the mouth widely, pain in the cheek region or jaw. Other symptoms are severe headache /migraine /dizziness, tinnitus ringing of ears), neck or shoulder pain, pain in or under ears Clicking is the sound heard while opening the mouth¹⁵.

The resultant increase in intra-articular pressure may cause the disc to "pop" backwards (or the condyle to "pop" forward), usually with a click, so that the meniscus is again centered over the condylar head, and the jaw movement carries on normally. The click can occur in as little as four one-hundredths of a second¹⁶.

Deviation of mandible while opening the mouth is most noted

Variable	Crude OR	(95% CI OR)	X ² statistic (df) ^a	P-value
Position A				
Yes	0.80	(0.42; 1.56)	0.517 (1)	0.523
No	1			
Position B				
Yes	0.95	(0.62;1.45)	0.063 (1)	0.802
No	1			
Position C				
Yes	1.24	(0.72; 2.13)	0.596(1)	0.437
No	1			
Position D				
Yes	1.03	(0.59; 1.80)	0.012 (1)	0.913
No	1			
Less than 20 minutes				
Yes	0.66	(0.38; 1.23)	1.690 (1)	0.203
No	1			
20 to 30 minutes				
Yes	1.10	(0.70; 1.74)	0.164 (1)	0.685
No	1			
40 to 50 minutes				
Yes	0.96	(0.63; 1.48)	0.027(1)	0.869
No	1			
More than 1hour				
Yes	1.24	(0.65;2.38)	0.413(1)	0.517
No	1			

^aLikelihood ratio (LR) test

Table 8. The association between neck or shoulder pain and positions and time spending in mentioned position.

malformations of face, leading to alteration of lower third of the face.

Pain in cheek and jaw area is the most common abnormality of TMD, Common in females having mean age of 33 years. Frequently involved muscle is masseter followed by the temporalis muscles. Location of Pain is usually the cheek areas, and exacerbates during mouth opening or eating¹⁷

Tinnitus, pain in the ears or under the ears, severe headache, migraine, dizziness, and neck or shoulder pain are most common symptoms related to TMJ disorders. An internally produced neural signal perceived as sound is called tinnitus. Prevalence of tinnitus of around 10-15 percent has been consistently reported in epidemiological studies although majority of people with tinnitus are not seemed bothered about it.¹⁸

Various etiological factors are considered for tinnitus including Meniere syndrome, infection of ear, drugs like Non-steroidal anti-inflammatory drugs, aspirin, noise from firearms, planes, loud music which could cause ear trauma and aging. Jaw bone are the main reason tinnitus is associated to dentistry. The lower jaw may be moved out of healthy position if the bite is not healthy or normal, intern pressing back to ear canal or inflammation of retrocuspid area will press on ear canal, so it is always important for dentist to evaluate occlusion.¹⁹

Tooth size discrepancies can also lead to occlusal problems. In a study on Bangladeshi population it showed that population with dental mid-line discrepancies, decreased overjet/overbite with dental mid-line discrepancy may be predictors of tooth size discrepancies²⁰. It was also noted that dental and skeletal class 1 malocclusion can cause increase in maximum voluntary molar bite force²¹.

In our study, out of 399 patients only 45 had tinnitus, which was insignificant and was not selected in the logistic regression to be furthered analyzed. Likewise, number of patients reported with pain in or under ears was not remarkable.

Headache had been well-substantiated to be correlated with TMDs in many different epidemiologic studies, as well as clinical trials²².

Even in a general adult population, headache also associated with symptoms of TMDs²³. In our study, there were huge number of respondents reported severe headache, migraine, and dizziness, but they were not related to any mentioned position. There were one-third of our respondents claimed to have neck or shoulder pain, which was the second most common symptoms related to TMJ after severe headache, migraine, and dizziness. Similarly, their symptoms were not specific to any of the mentioned position. These two common symptoms encountered by the patients could be explained by the mechanism of head, neck, and shoulder muscles activation during mastication, in which the muscle resistance transforms into fatigue when there is an internal derangement of TMJ.

Although none of the mentioned position in our study directly contributes to these symptoms, improper positioning being their risk factor remains since types of position in the questionnaires were limited. In this study none of the improper positions are associated with TMJ abnormalities and symptoms. However spending time on mention position influencing some of the TMJ abnormalities and symptoms.

CONCLUSION AND CLINICAL SIGNIFICANCE

Despite the improper positions not contribute to developing TMJ abnormalities and symptoms, time of spending at that particular position in work place or any other places contribute TMJ abnormalities and symptoms. Maintaining positions for less than 20 minutes each day may intensify the likelihood of TMJ abnormalities, and the odds could be accentuated with longer time span. However, symptoms related to TMJ were not specific to any of the mentioned position, which could be explained by the insignificant distribution of such symptoms among the respondents. As we did not include more types of improper position in the questionnaire, it is difficult to evaluate the possibility of other not mentioned erroneous position in contributing to or accentuating TMD. The influence of these factors remains to be determined. But off course the practitioners have to make sure that TMD patients have to be educated about the ill effects that can be caused by the practice of such improper positions on a daily basis

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